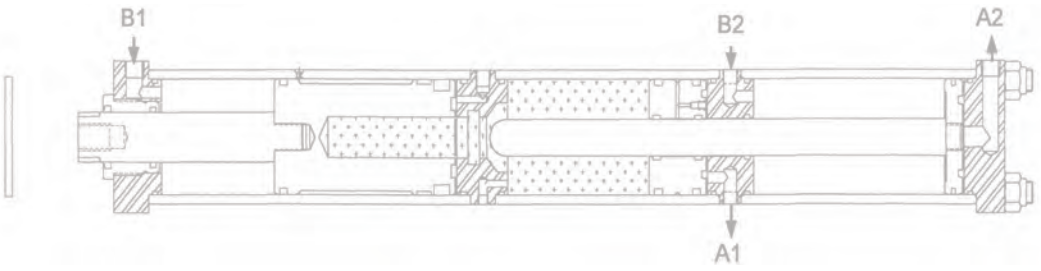
User Guide: Air/Oil Hydraulic Cylinders

Air Powered Hydraulic Cylinders for Forming and Assembly

Clinching | *Piercing* | *Riveting* | *Stamping* | *Bending*



Eleven standard sizes available from 1 to 100 tons

Two standard design configurations available

Ideal for a wide variety of applications

BTM® CORPORATION

www.BTMcorp.com

810-364-4567

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Disclaimer: BTM Reserves the right to ammend the contents of this manual without notice. Contact BTM to verify the latest revision.

CAUTION! - *Always disconnect air and electrical supply lines before working on or around Air/Oil Cylinders!*

BTM's Air/Oil Cylinders are precision devices designed to produce very high output forces utilizing a compressed air supply. Appropriate safeguards to protect both the operator and maintenance personnel are the responsibility of the end user.

Please read this user guide before proceeding with the installation or maintenance of a BTM Air/Oil Cylinder.

WARNING! - *Dissassembling the cylinder prior to the expiration of the warranty will void the warranty.*

— Do not modify the working components of the cylinder without written authorization. —

1.2 PATENTS AND REGISTERED TRADEMARKS

The BTM Air/Oil Cylinders featured in this User Guide are patented products which are licensed under agreement by BTM Corporation. All Rights Reserved.

This user guide is copyrighted and may not be copied, reproduced, or distributed without expresed written permission of BTM Corporation.

BTM reserves the right to change product specification and related support materials without notice.

This manual covers standard BTM Air/Oil Cylinders. Special cylinders may not be covered. Contact BTM for more information.

1.3 PRODUCT IDENTIFICATION

BTM Air/Oil Cylinders are shipped from the factory with an identification plate attached to the cap end of the cylinder. The identification plate contains the cylinder model number and serial number.

Model No. Example: **BTMCYL - I - 4 - 4.00 - .50 - FH**

I = In-line Design

4 = 4 tons force @ 100 PSI

4.00 = 4.00" total cylinder stroke

.50 = .50" power stroke

FH = FH mounting style

Serial No. Example: **4055**

It is important to provide both model and serial numbers when ordering replacement cylinders and/or seal kits.

2.0 GENERAL SAFETY

BTM Cylinders are designed and built according to the state of the art utilizing CAD/CAM techniques, accepted industry standards, Quality Assurance systems, and trained personnel. All BTM Cylinders are designed and manufactured to be operationally safe. However, due to the nature of the product, (pressing) there are areas of the product which cannot be protected at the factory. For this reason, good personal safety procedures and practices are required to protect the operator and maintenance personnel. Risks may arise if the cylinder is used or maintained by untrained personnel or in any way which is inconsistent with it's intended use and/or purpose.

2.1 APPLICATION AND INTENDED USE

BTM Cylinders may only be used for their intended purpose: *as a penumatic-hydraulic power cylinder built exclusively for industrial applications in which pressing forces are required.* Any other applications are regarded as inconsistent with the inded use and the manufacturer, and BTM Corporation, is not liable for any damage resulting therefrom, the risk being assumed in this case by the user. Arbitrary changes or modifications to the cylinder, (mechanical, hydraulic, or pneumatic) exempt Aries Engineering Co., Inc. (the manufacturer) and BTM Corporation from any liability for any damage resulting therefrom.

2.2 OPERATING SAFETY

Work on power-driven equipment should only be entrusted to persons who:

a. are confidently able to carry out the work on their own.

b. are under the supervision of someone familiar with this work after previous training.

c. or, are accordingly authorized to perform the work.

3.0 PRODUCT DESCRIPTION

BTM Cylinders are purely pneumatically driven cylinders with an integral pneumatic-hydraulic power stroke. Power stroke initiation is user preference of either distance, time delay, or part contact, (opposing force).

Cylinder construction is of modular sandwich design joined together with, depending upon the model, four or eight tie-rods. All other parts are inserted into the cylinder.

BTM cylinders operate with compressed air from 30 to 100 PSI (approx. 2 to 7 bar) maximum. Output forces, (in Power Stroke) range from 670 lb. to 142,900 lb, (1.5 kN to 1750 kN) depending on the model.

3.1 CYLINDER PORT LOCATIONS (IN-LINE SERIES)
3.2 CYLINDER COUPLING LOCATIONS
3.3 CYLINDER COMPONENTS

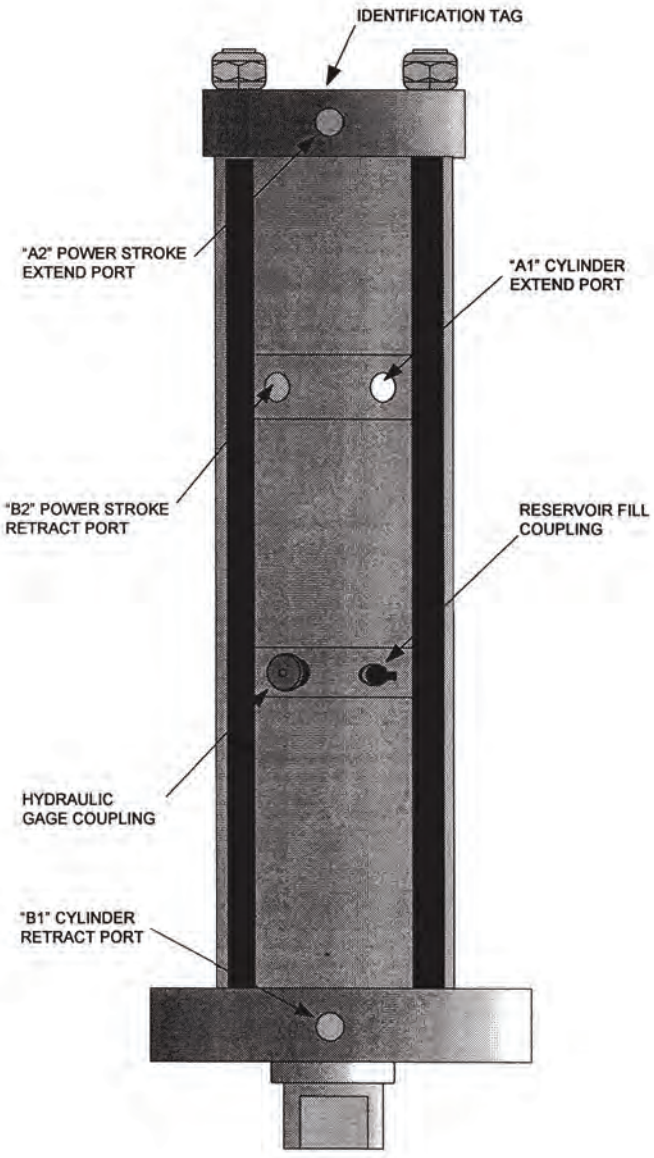


Fig. 3.1/3.2

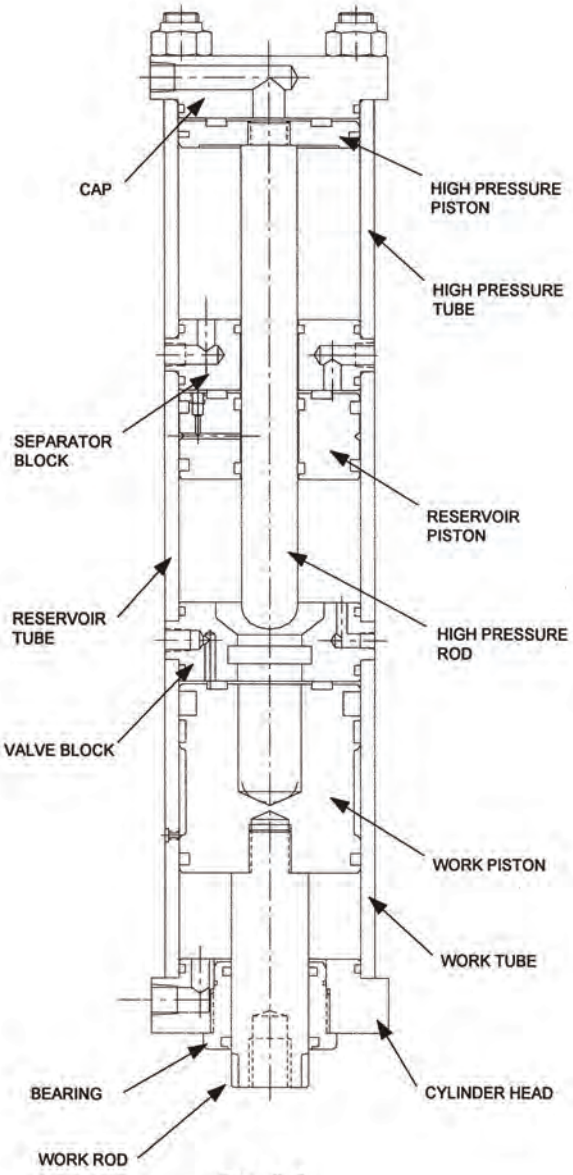
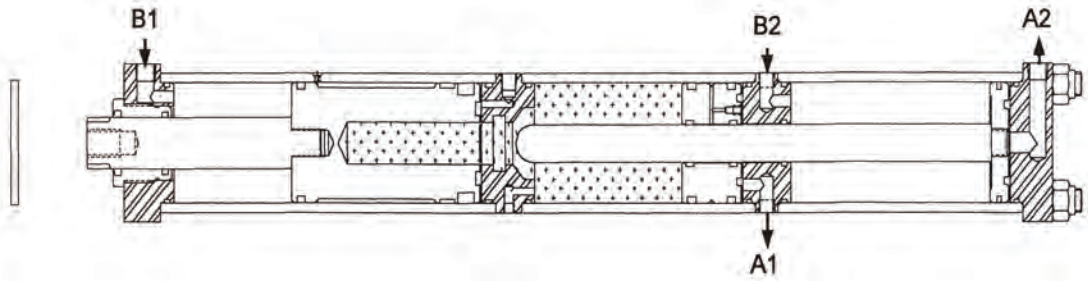


Fig. 3.3

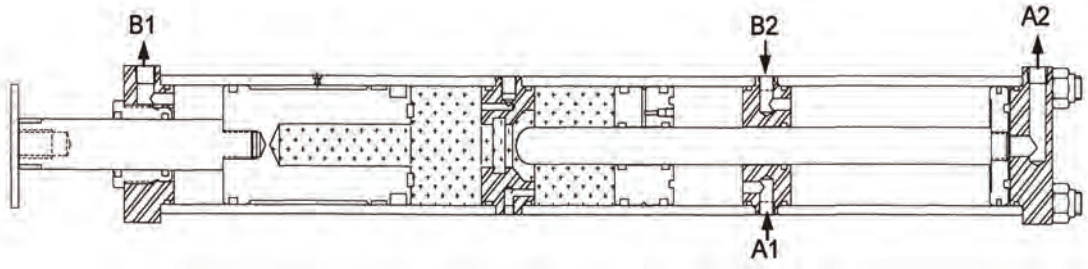
4.0 FUNCTIONAL DESCRIPTION

Note: During the Approach and Retract stroke, air must be directed to port "B2". Failure to do so may cause the high pressure rod to extend into the valve block therefore stopping the cylinder work rod.

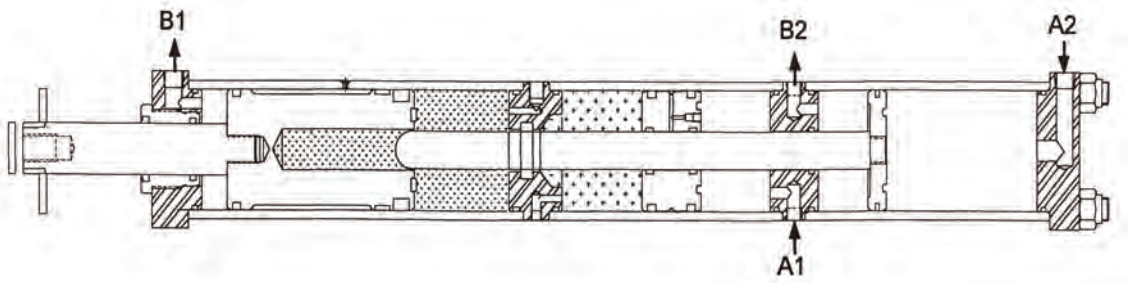
4.1 In-Line Series



1. Cylinder Retracted - In this view air is directed to Ports B1, and B2 fully retracting the Reservoir, Working, and High Pressure Pistons.



2. Approach Stroke - Air is directed to Port A1. The Reservoir piston advances, displacing the reservoir oil through the Valve Block to the back of the Working Piston, advancing the cylinder rod (at low force) until meeting resistance (work surface or part contact).



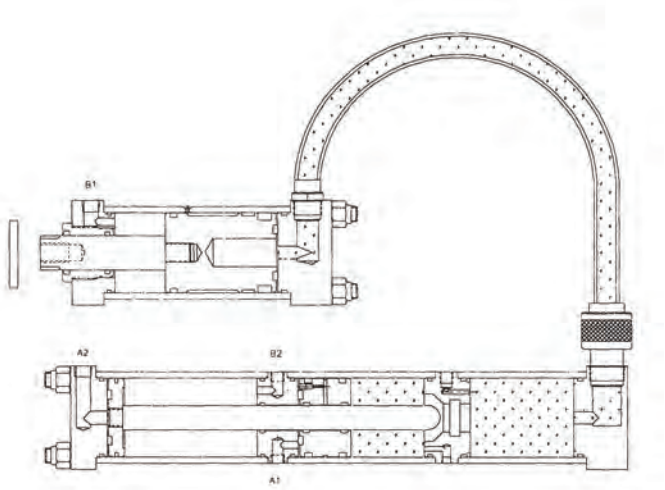
3. Power Stroke - Regulated air pressure is applied to Port A2. High Pressure Piston and Rod advance until contacting the Valve Block seal, isolating the reservoir oil from the oil contained in the working section. Continued movement intensifies and displaces the trapped oil developing the Power Stroke. Step 1 returns all three pistons and oil to the retracted position.

5.0 FUNCTIONAL DESCRIPTION

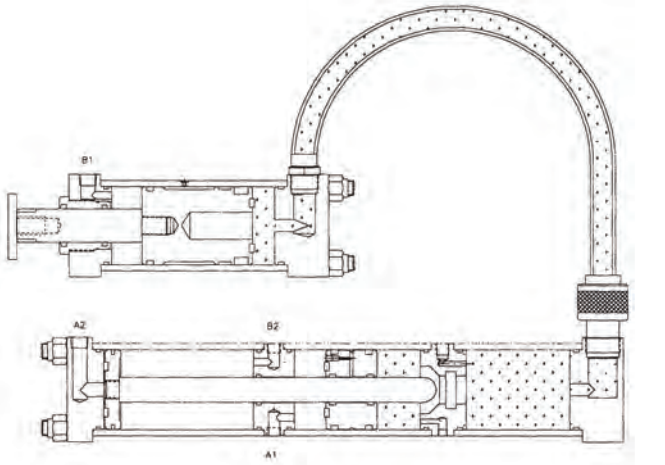
5.1 Satellite Series

Note: During the Approach and Retract stroke, air must be directed to port "B2". Failure to do so may cause the high pressure rod to extend into the valve block therefore stopping the cylinder work rod.

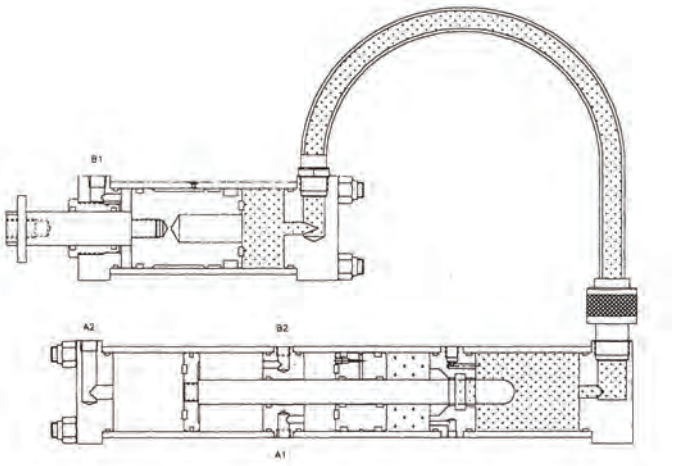
1. Cylinder Retracted - In this view air is directed to Ports B1, and B2 fully retracting the Reservoir, Working, and High Pressure Pistons.



2. Approach Stroke - Air is directed to Port A1. The Reservoir piston advances, displacing the reservoir oil through the Valve Block to the back of the Working Piston, advancing the cylinder rod (at low force) until meeting resistance (work surface or part contact).



3. Power Stroke - Regulated air pressure is applied to Port A2. High Pressure Piston and Rod advance until contacting the Valve Block seal, isolating the reservoir oil from the oil contained in the working section. Continued movement intensifies and displaces the trapped oil developing the Power Stroke. Step 1 returns all three pistons and oil to the retracted position.



6.0 FUNCTIONAL DESCRIPTION

Note: During the Approach and Retract stroke, air must be directed to port "B2". Failure to do so may cause the high pressure rod to extend into the valve block therefore stopping the cylinder work rod.

6.2 Power Stroke Limiter Option

The Power Stroke Limiter option (PSL) limits the travel of the high pressure piston and rod assembly during the power stroke cycle of the cylinder. *The PSL option limits the power stroke only. It does not limit the total stroke of the cylinder work rod.*

6.3 Adjusting the PSL

Limiting the stroke of the high pressure piston and rod assembly after it comes into contact with the valve block seal, permits control of the amount of oil displaced by the high pressure rod during the power stroke cycle. The amount of travel is determined by adjusting the locking ring and barrel assembly located on the cap end of the cylinder. Rotation of the adjustment barrel in a clock-wise direction decreases the amount of power stroke. Rotation of the adjustment barrel in a counter clock-wise direction increases the power stroke. The PSL option provides full adjustment of the complete power stroke, i.e, .000" to .500" for a .500 power stroke cylinder.

1. Loosen the allen head set screw on the locking ring.

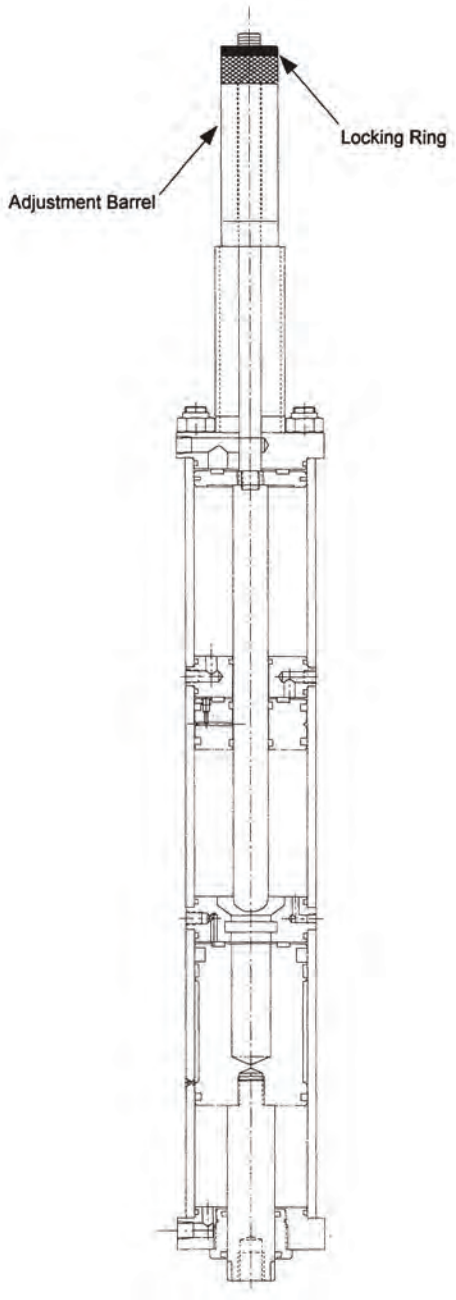
2. Loosen the allen head set screw on the adjustment barrel.

3. Rotate the adjustment barrel in a clock-wise direction to decrease the amount of power stroke.

4. Rotate the adjustment barrel in a counter clock-wise direction to increase the power stroke.

5. Rotate the locking ring until contacting the adjustment barrel. Tighten both locking ring and adjustment barrel set screws.

All BTM air/oil cylinders ordered with the PSL option are shipped from the factory with the locking ring and adjustment barrel in a fully clock-wise postiion, (.000" power stroke). Please adjust to application requirements before use.



6.0 FUNCTIONAL DESCRIPTION

6.3 Total Stroke Limiter Option

The Total Stroke Limiter option (TSL) limits the travel of the working piston and rod assembly during the operation of the cylinder. *The TSL option limits the total stroke of the cylinder work rod.*

6.4 Adjusting the TSL

Limiting the stroke of the working piston and rod assembly by a mechanical link to the adjustment barrel permits control of the amount of total cylinder travel. The amount of travel is determined by adjusting the locking ring and barrel assembly located on the cap end of the cylinder. Rotation of the adjustment barrel in a clock-wise direction decreases the amount of power stroke. Rotation of the adjustment barrel in a counter clock-wise direction increases the power stroke. All TSL options provide full adjustment of the complete cylinder stroke, i.e, .000" to 4.000" for a 4.000" stroke cylinder.

1. Loosen the allen head set screw on the locking ring.

2. Loosen the allen head set screw on the adjustment barrel.

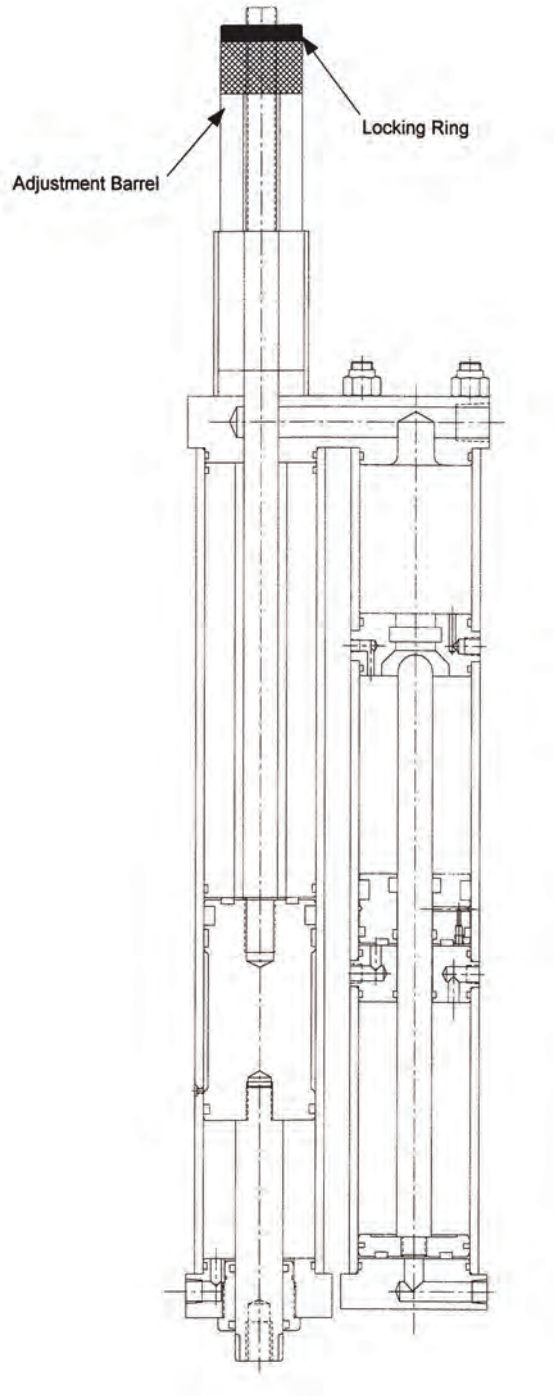
3. Rotate the adjustment barrel in a clock-wise direction to decrease the amount of power stroke.

4. Rotate the adjustment barrel in a counter clock-wise direction to increase the power stroke.

5. Rotate the locking ring until contacting the adjustment barrel. Tighten both locking ring and adjustment barrel set screws.

All BTM air/oil cylinders ordered with the TSL option are shipped from the factory with the locking ring and adjustment barrel in a fully clock-wise postiion, (.000" power stroke). Please adjust to application requirements before use.

Note: During the Approach and Retract stroke, air must be directed to port "B2". Failure to do so may cause the high pressure rod to extend into the valve block therefore stopping the cylinder work rod.



7.0 CYLINDER INSTALLATION

7.1 Attach the cylinder to the mounting surface with the integral head end mount. Use only grade 8 bolts.

7.2 Provide a way to reduce or eliminate side-loading of the cylinder rod. Failure to do so will cause excessive wear of the guide bearing, seals and wear strip.

Cylinders returned for repair with indications of side-loading will not be covered under warranty.

7.3 All cylinders are provided with a high pressure gage coupling and reservoir fill coupling. Allow room to access for future options and cylinder service.

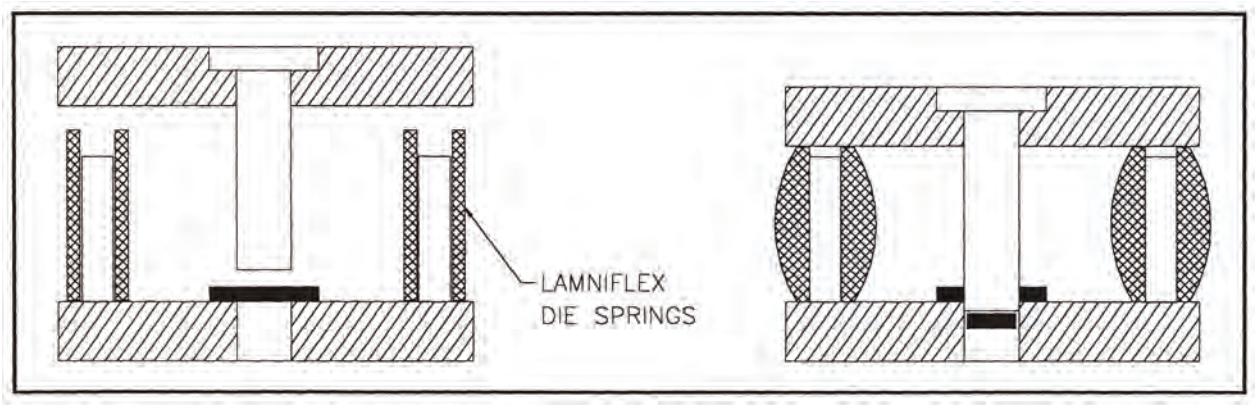
7.4 Punching and piercing applications must provide and external resistance to the cylinder rod and tooling prior to break-through. (see the illustration below) Failure to do so may cause a vacuum inside the cylinder, adversely effecting performance.

7.5 Air directional control valves should be mounted within five, (5) feet of the cylinder. Use of suitable diameter tubing, (tube I.D. equal to the cylinder port size) is recommended.

7.6 Install an air lock-out valve on the main air supply line upstream to the directional control valves. If the air supply is to be shut off for an extended period of time and tooling weight exceeds 25% of the cylinder approach force, mechanically block tooling in the retracted position.

7.7 Do not exceed 100 PSI air pressure to the cylinder.

7.8 Use of clean filtered air, (40 micron minimum) is mandatory. Light lubrication of the supply air will extend cylinder service life.



In many applications, the forward travel of the cylinder during high pressure is limited by the application itself, such as resistance wedling, staking, etc. However, for punching and piercing applications the forward travel of the cylinder must be limited after punching through the material. If external resistance is not provided, the cylinder rod will continue to travel causing a potential vacuum in the high pressure/reservoir sections of the cylinder, adversely affecting performance. If a single point punch is used on the application, a single spring may be located around the punch which will also act as a stripper spring. We recommend use of LamniFlex Polyurethane Die Springs. Please contact BTM for additional information.

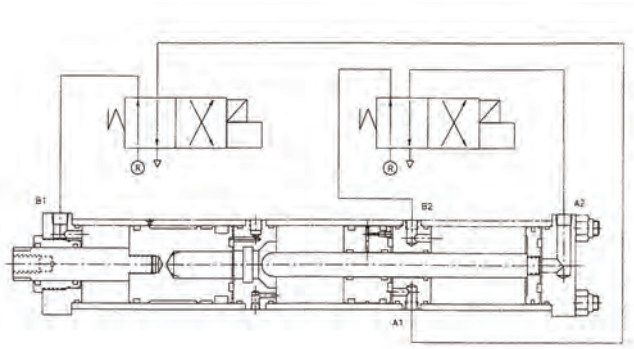
8.0 CONTROL SYSTEMS

BTM Air/Oil Cylinders are similar to two, (2) typical air cylinders, with one cylinder extending before the other, and both retracting at the same time, (see the illustration to the right). Each BTM Air/Oil Cylinder requires two, (2) pneumatic directional control valves for operation. Pneumatic directional control valves can be either mechanical, solenoid or remote air piloted. Valve size must be of suitable flow to permit proper cylinder function, (refer to catalog for cylinder air consumption).

Pneumatic flow control valves may be customer installed, (metered out) at cylinder ports B1 and B2 to control the speed of the cylinder and speed of the power stroke.

Please ensure the main air supply is dry, clean (40 micron), and if possible lightly lubricated.

Unique to the BTM Air/Oil Cylinder design is the ability to regulate the Approach Stroke force independently from the Power Stroke Force through use of separate air regulators. Stacking regulators installed on the valve manifold are recommended for best performance.



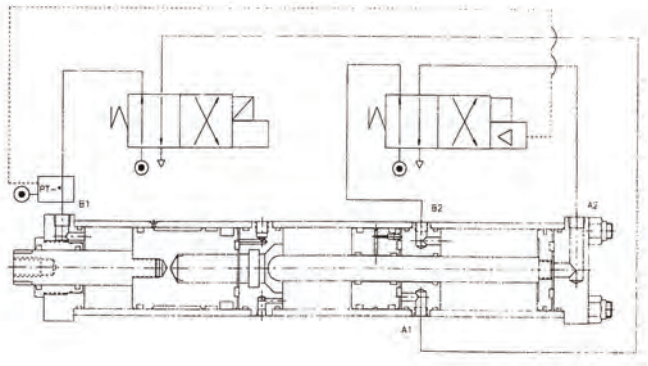
Please refer to pages 14-15 for detailed/enlarged view of control circuitry drawing.

8.1 SEQUENCE FROM APPROACH STROKE TO POWER STROKE

All BTM Air/Oil Cylinders may be sequenced into the power stroke anywhere within the total stroke of the cylinder. Sequencing into the power stroke is customer defined. Recommended suggestions are:

Time Delay
External Proximity Switch
Threshold Sensor

The BTM Air/Oil Cylinders, PT and ELT series threshold sensors are a threshold/not sensor installed directly into the cylinder B1 port. Both sensors provide either a pneumatic, (PT) or electrical, (ELT) signal when the air exhausting from the B1 cylinder port has decayed to 6 PSI, indicating the cylinder rod and customer tooling have made contact with the work surface. (see illustration to the right)



Please refer to pages 14-15 for detailed/enlarged view of control circuitry drawing.

8.2 OIL PRESSURE MONITORING

All BTM Air/Oil Cylinders are equipped with an IC-1 gage port coupling, (refer to page 3.1 for location). The IC-1 provides an easy to connect, threaded coupling for attachment of:

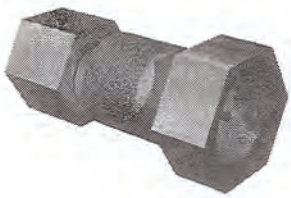
- Oil Pressure Gage
- Oil Pressure Switch
- Oil Pressure Electronic Transducer
- Oil Pressure Hose Assembly

When attaching any monitoring device to the cylinder, make sure the device and connecting lines are filled with oil. Failure to do so will impair the function of the monitoring device and allow air into the reservoir section of the cylinder.

Pressure monitoring devices such as switches and transducers are used to verify that the internal oil pressure of the cylinder has achieved a customer specified pressure. As a result, the following control functions can be obtained:

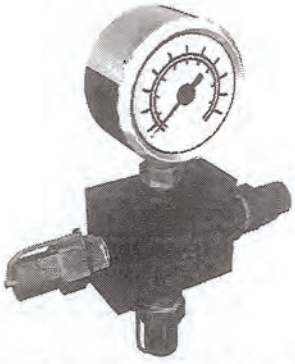
- changeover to retract stroke when a user specified oil pressure has been reached. (oil pressure is proportional to cylinder output force).
- dwell time for the retract stroke for applications such as embossing or riveting.
- emergency stop or output signal if a certain pressure is not reached, (quality control).
- activation of functions external to the cylinder.

G0-1 Gage Kit



GA-1 Gage Adapter

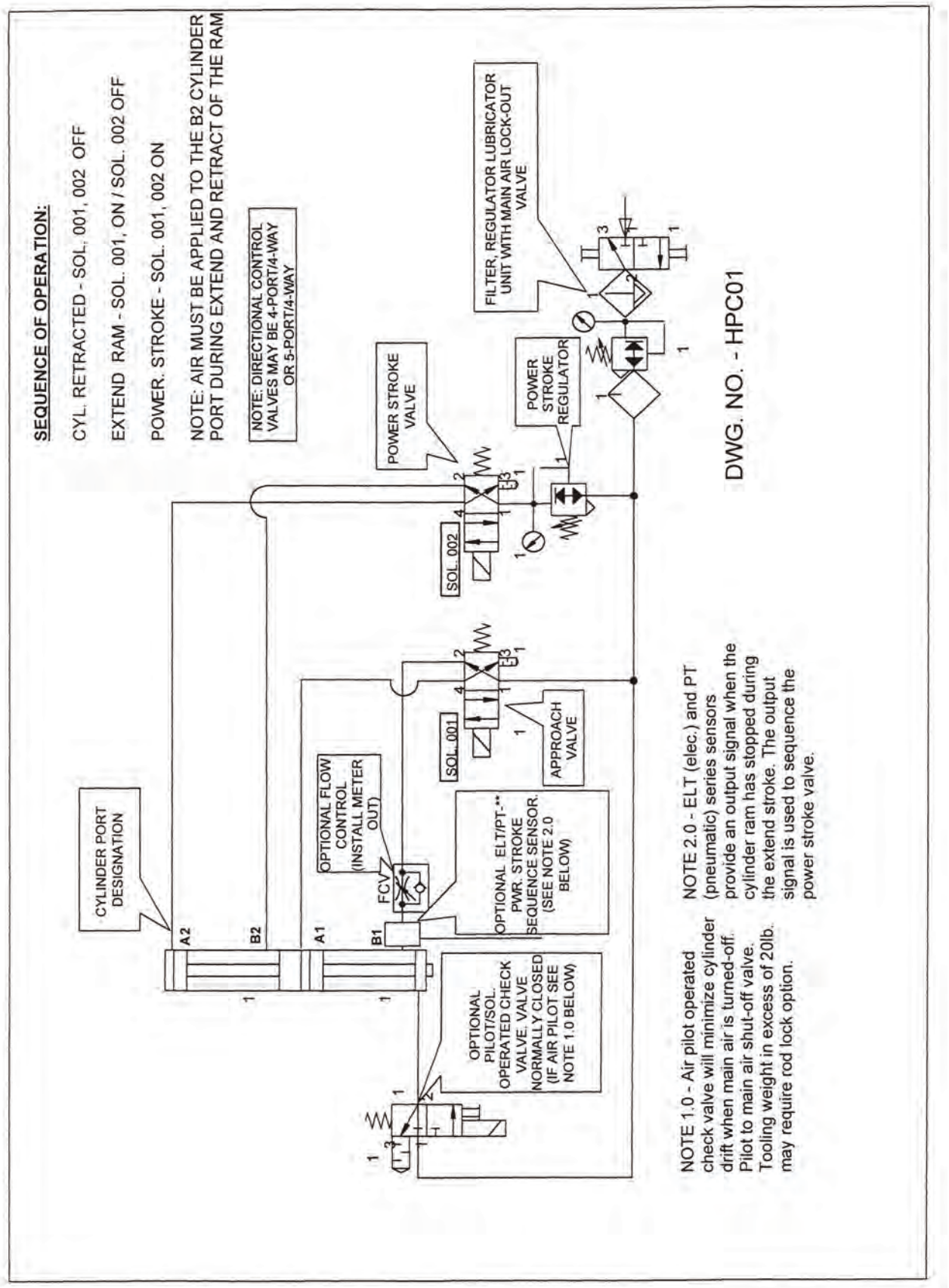
PHA-** Hose Assembly



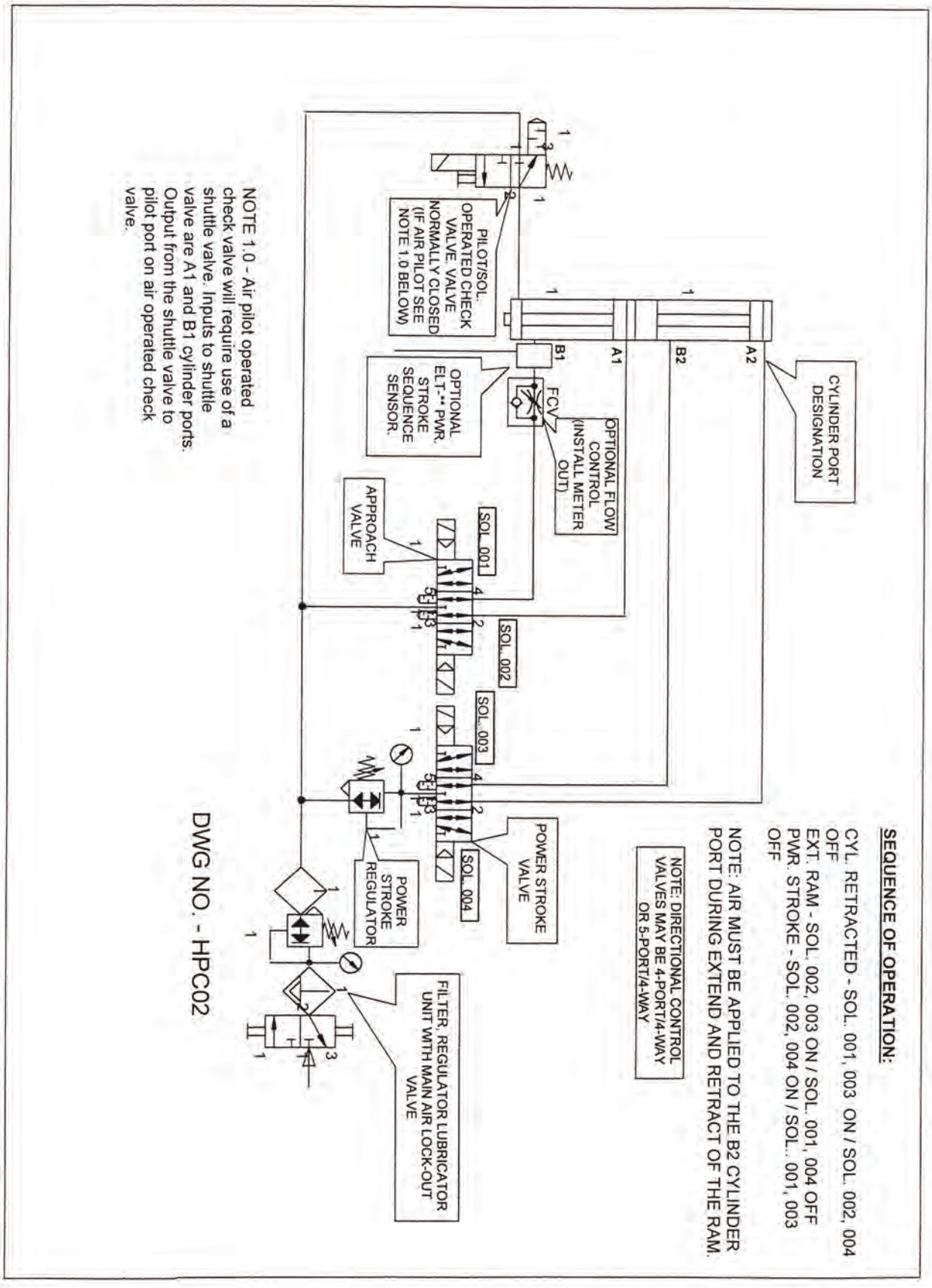
PB-1 Pressure Block Module

SW-** Pressure Switch

CONTROL CIRCUITRY DIAGRAM


SEQUENCE OF OPERATION:
CYL. RETRACTED - SOL. 001, 002 OFF
EXTEND RAM - SOL. 001, ON / SOL. 002 OFF
POWER. STROKE - SOL. 001, 002 ON
NOTE: AIR MUST BE APPLIED TO THE B2 CYLINDER PORT DURING EXTEND AND RETRACT OF THE RAM
NOTE: DIRECTIONAL CONTROL VALVES MAY BE 4-PORT/4-WAY OR 5-PORT/4-WAY
POWER STROKE VALVE
FILTER, REGULATOR LUBRICATOR UNIT WITH MAIN AIR LOCK-OUT VALVE
POWER STROKE REGULATOR
SOL. 002
SOL. 001
APPROACH VALVE
CYLINDER PORT DESIGNATION
OPTIONAL FLOW CONTROL (INSTALL METER OUT)
FCV
OPTIONAL ELT/PT-** PWR. STROKE SEQUENCE SENSOR. (SEE NOTE 2.0 BELOW)
OPTIONAL PILOT/SOL. OPERATED CHECK VALVE. VALVE NORMALLY CLOSED (IF AIR PILOT SEE NOTE 1.0 BELOW)
A2
B2
A1
B1
DWG. NO. - HPC01
NOTE 1.0 - Air pilot operated check valve will minimize cylinder drift when main air is turned-off. Pilot to main air shut-off valve. Tooling weight in excess of 20lb. may require rod lock option.
NOTE 2.0 - ELT (elec.) and PT (pneumatic) series sensors provide an output signal when the cylinder ram has stopped during the extend stroke. The output signal is used to sequence the power stroke valve.

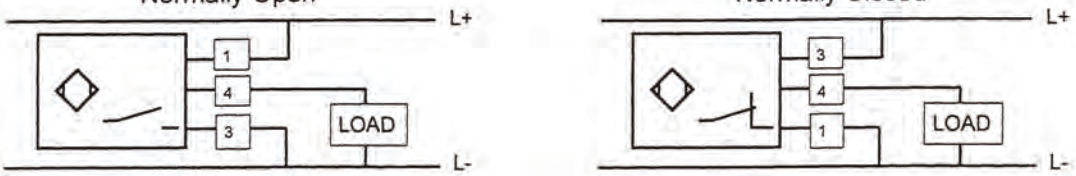
CONTROL CIRCUITRY DIAGRAM


SEQUENCE OF OPERATION:
CYL. RETRACTED - SOL. 001, 003 ON / SOL. 002, 004 OFF
EXT. RAM - SOL. 002, 003 ON / SOL. 001, 004 OFF
PWR. STROKE - SOL. 002, 004 ON / SOL. 001, 003 OFF
NOTE: AIR MUST BE APPLIED TO THE B2 CYLINDER PORT DURING EXTEND AND RETRACT OF THE RAM.
NOTE: DIRECTIONAL CONTROL VALVES MAY BE 4-PORT/4-WAY OR 5-PORT/4-WAY
CYLINDER PORT DESIGNATION
A1
A2
B1
B2
FCV
OPTIONAL FLOW CONTROL (INSTALL METER OUT)
PILOT/SOL. OPERATED CHECK VALVE. VALVE NORMALLY CLOSED (IF AIR PILOT SEE NOTE 1.0 BELOW)
OPTIONAL ELT-** PWR. STROKE SEQUENCE SENSOR.
APPROACH VALVE
SOL. 001
SOL. 002
SOL. 003
SOL. 004
POWER STROKE VALVE
POWER STROKE REGULATOR
FILTER, REGULATOR LUBRICATOR UNIT WITH MAIN AIR LOCK-OUT VALVE
NOTE 1.0 - Air pilot operated check valve will require use of a shuttle valve. Inputs to shuttle valve are A1 and B1 cylinder ports. Output from the shuttle valve to pilot port on air operated check valve.
DWG NO. - HPC02

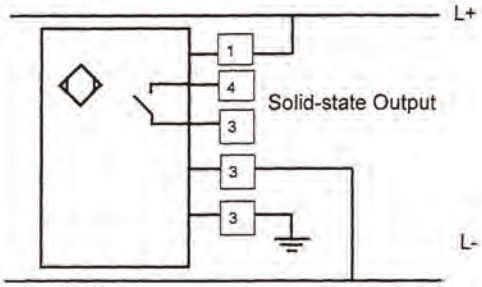
PRESSURE SWITCH WIRING SCHEMATICS

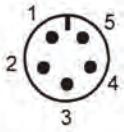
SWA-01 (50-1000 PSI)
SWA-02 (250-5000 PSI)
18-30 VDC, PNP Output

Micro DC Connection



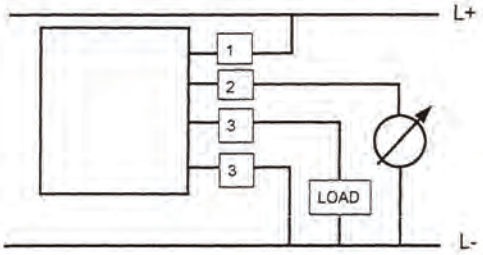
SWA-03 (50-1000 PSI)
SWA-04 (250-5000 PSI)
102-132 VAC. Solid-state Relay Output

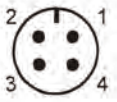




Mini AC Connection

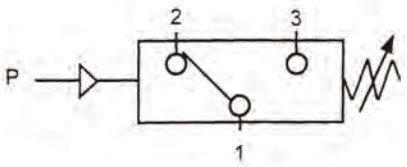
SWD-01 (50-1000 PSI)
SWD-02 (250-5000 PSI)
Analog 4-20 ma Output and Switching Output, 20-30VDC Supply





Micro DC Connection

SW-01 (150-2300 PSI)
AC/DC Supply, Contact Output. 3-Pin DIN Connector



9.0 REFILLING CYLINDERS

All BTM Air/Oil Cylinders are pre-filled and tested at the factory. The internal oil reservoir contains sufficient excess oil, (30%) that, with normal operation will operate for millions of trouble free cycles.

All units are supplied with a reservoir fill coupling identified as “F” on the cylinder. The fill coupling is protected by a black rubber dust cap. Cylinders are also equipped with a low oil level indicator pin, (4 Ton and larger) which will extend outward approximately 3/16” when the cylinder requires refilling. To refill the cylinder please use only the unit part number HFP-2. Fill with an ISO 32 hydraulic oil.

9.1 IN-LINE & SATELLITE SERIES CYLINDERS

9.2 Filling Procedure

1. Fill the HFP-2 fill unit with ISO 32 oil or equivalent.

2. Retract cylinder rod.

3. Depress the inner ring on the fill unit coupling, (opening coupling) and depress the fill unit handle until all air has been vented from the fill unit tubing. Close coupling.

4. Remove the black rubber dust cover from the cylinder fill coupling. Connect fill unit to cylinder.

5. Repeatedly depress the fill unit handle until the handle becomes difficult to depress, (cylinder is full).

6. Disconnect the fill unit from the cylinder. Replace rubber dust cover. Push in indicator pin. Procedure complete.

10.0 VENTING

BTM Air/Oil Cylinders utilize a patented, total air/oil separation system which under normal operating conditions eliminates the possibility of air entering into the working and reservoir sections of the cylinder. Improper installation of oil pressure monitoring devices, and/or removal of either gage or fill couplings will permit air to enter both oil sections of the cylinder. Air intrained in the oil will adversely effect cylinder performance.

10.1 VENTING PROCEDURE

10.1.1 In-Line Series

1. Remove the fill line and coupling from the HFP-2 fill unit. Retract cylinder and block in retracted position.

2. Remove the black rubber dust cover from the cylinder fill coupling. Connect the fill coupling to the cylinder. Place the opposite end of the fill line into a container of suitable size.

3. Depress and hold the manual overide on the fast approach directional control valve until all oil and air have been vented from the cylinder. Disconnect the fill coupling. Release manual overide.

4. Reattach the fill unit coupling and line to the fill unit. Refill cylinder with oil, (refer to 9.1).

10.1.2 Satellite Series

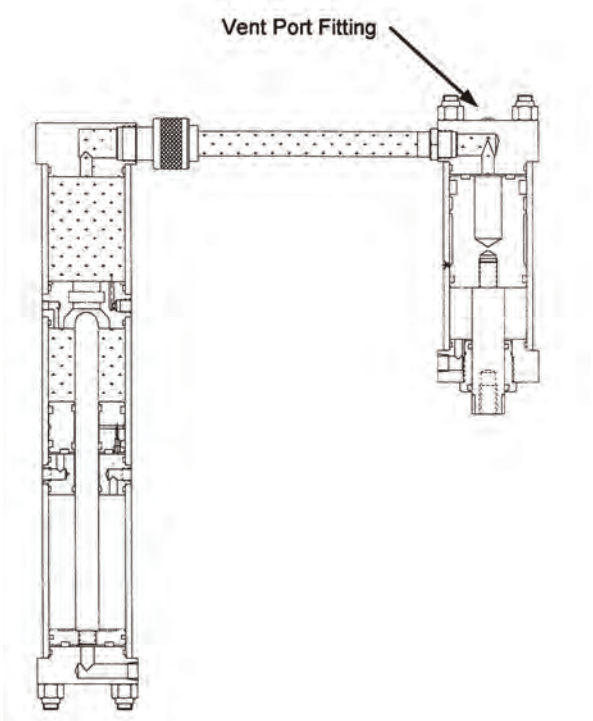
1. Position the booster/reservoir unit and working cylinder vertically as shown in the illustration below. The Vent Port Fitting located on the cap end of the work cylinder must be at a greater or equal height then the booster/reservoir unit.

2. Fill the HFP-2 fill unit with ISO 32 oil or equivalent.

3. Depress the inner ring on the fill unit coupling, (opening coupling) and depress the fill unit handle until all air has been vented from the fill unit tubing. Close coupling.

4. Remove the black rubber dust cover from the cylinder fill coupling. Connect fill unit to cylinder.

5. Loosen the vent port fitting located on the cap end of the work cylinder. Repeatedly depress the fill unit handle until all air has been vented from the vent port fitting. Disconnect fill unit from cylinder. Procedure complete.



11.0 AIR PRESSURE/HYDRAULIC PRESSURE/OUTPUT FORCE TABLE*

* Tolerance for data +/- 5 %. All values in pounds, (lb.)

Air Pressure	BTMCYL-I/S 1 Ton Series	BTMCYL-I/S 2 Ton Series	BTMCYL-I/S 4 Ton Series	BTMCYL-I/S 10 Ton Series	BTMCYL-I/S 15 Ton Series	BTMCYL-I/S 20 Ton Series	BTMCYL-I/S 30 Ton Series	BTMCYL-I/S 40 Ton Series	BTMCYL-I/S 50 Ton Series
PSI	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.
30	210/670	330/1636	316/2626	396/7785	480/9422	591/11601	651/19540	852/24086	630/31663
40	280/893	440/2181	422/3501	528/10380	644/12641	788/15468	921/26053	1136/32114	840/42218
50	350/1117	550/2727	528/4377	661/12975	805/15802	985/19335	1152/32567	1420/40143	1050/52773
60	420/1340	660/3272	633/5252	793/15570	966/18962	1182/23202	1382/39080	1704/48172	1260/63327
70	490/1563	770/3817	739/6127	925/18165	1127/22123	1379/27069	1612/45593	1988/56200	1470/73882
80	560/1787	880/4363	844/7003	1057/20760	1288/25283	1576/30936	1843/52107	2272/64229	1680/84436
90	630/2010	990/4908	950/7878	1189/23355	1449/28443	1773/34803	2073/58620	2556/72258	1890/94991
100	700/2234	1100/5454	1056/8754	1322/25950	1600/31408	1970/38671	2304/65134	2840/80286	2100/105546

11.1 APPROACH/RETRACT TABLE*

* Tolerance for data +/- 5 %. All values in pounds, (lb.)

Air Pressure	BTMCYL-I/S 1 Ton Series	BTMCYL-I/S 2 Ton Series	BTMCYL-I/S 4 Ton Series	BTMCYL-I/S 10 Ton Series	BTMCYL-I/S 15 Ton Series	BTMCYL-I/S 20 Ton Series	BTMCYL-I/S 30 Ton Series	BTMCYL-I/S 40 Ton Series	BTMCYL-I/S 50 Ton Series
PSI	Approach/Retract	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.	Hyd PSI/Force lb.
30	94/70	147/123	248/204	588/494	588/494	588/494	848/701	848/701	1507/1296
40	125/94	196/164	331/272	785/659	785/659	785/659	1130/934	1130/934	2010/1728
50	157/117	245/205	414/340	981/824	981/824	981/824	1413/1168	1413/1168	2513/2160
60	188/141	294/246	497/408	1177/989	1177/989	1177/989	1696/1402	1696/1402	3015/2592
70	219/164	343/287	580/476	1374/1154	1374/1154	1374/1154	1978/1635	1978/1635	3518/3024
80	251/188	392/328	663/544	1570/1319	1570/1319	1570/1319	2261/1869	2261/1869	4020/3456
90	282/211	441/369	746/612	1766/1484	1766/1484	1766/1484	2544/2103	2544/2103	4523/3888
100	314/235	490/411	829/681	1963/1649	1963/1649	1963/1649	2827/2337	2827/2337	5026/4320

11.1.1 Cylinder Break-away Forces

New BTM Air/Oil Cylinders may require 35 PSI of air pressure for the fast approach and retract stroke. Typically 50 PSI of air pressure is recommended for reliable operation until the cylinder seals have seated. Please refer to the Quality Assurance certification bulletin attached to the cylinder for specific minimum break-away air pressures.

12.0 PROBLEMS, CAUSES, SOLUTIONS

12.1 Cylinder Rod Doesn't Extend

PROBLEM	CAUSE	SOLUTION
Cylinder rod doesn't extend	- Compressed air supply insufficient	Increase air pressure
	- Directional control valves not shifting	Repair/replace valve
	- Sideloading of the cylinder rod, (misalignment of the rod and tooling)	Repair/install alignment coupling
	- Air is not applied to the B2 cylinder port during the approach or retract stroke	Repair control circuit

12.2 Cylinder Rod Doesn't Retract

PROBLEM	CAUSE	SOLUTION
Cylinder rod doesn't retract	- Compressed air supply insufficient	Increase air pressure
	- Directional control valves not shifting	Repair/replace valve
	- Sideloading of the cylinder rod, (misalignment of the rod and tooling)	Repair/install alignment coupling
	- Air is not applied to the B2 cylinder port during the approach or retract stroke	Repair control circuit

12.3 Cylinder Will Not Develop Power Stroke

PROBLEM	CAUSE	SOLUTION
Cylinder will not develop power stroke	- Compressed air supply insufficient	Increase air pressure
	- Directional control valves not shifting	Repair/replace valve
	- Reservoir oil is low	Refill reservoir
	- Insufficient power stroke for application	
	- air has been allowed into the oil sections of the cylinder	Vent and/or refill cylinder

13.0 CYLINDER SEAL REPLACEMENT

1. Before disassembly of the cylinder ensure all air lines have been disconnected.

WARNING - Disassembly of this device while under air pressure may cause the components to suddenly come apart!

2. Drain oil from cylinder reservoir by connecting the HFP-2 fill unit to the cylinder fill coupling. Depress the manual override on the directional control valve until oil has stopped flowing from the cylinder.

3. Loosen cylinder tie-rods evenly. Remove tie-rods. Disassemble components.

4. Remove seals and clean parts carefully. Replace seals, noting seal direction and location. (suggestion: remove, clean and replace seals, one component at a time)

5. Assemble device.

6. Tighten tie-rods evenly to specified torque value. (see chart below).

7. Refill cylinder with oil. (section 9.1 on page 17)

BTMCYL-I/S 1 Ton Series	BTMCYL-I/S 2 Ton Series	BTMCYL-I/S 4 Ton Series	BTMCYL-I/S 10 Ton Series	BTMCYL-I/S 15 Ton Series	BTMCYL-I/S 20 Ton Series	BTMCYL-I/S 30 Ton Series	BTMCYL-I/S 40 Ton Series	BTMCYL-I/S 50 Ton Series
18 ft. lb.	22 ft. lb.	40 ft. lb.	110 ft. lb.	110 ft. lb.	110 ft. lb.	350 ft. lb.	350 ft. lb.	470 ft. lb.

14.0 SEAL KIT PART NUMBERS

14.1 Cylinder model number and serial number must be supplied when ordering replacement seal kits: Refer to the chart below for part numbers.

Model/Series	Part No.
BTMCYL-I/S-1	SKE-1
BTMCYL-I/S-2	SKE-2
BTMCYL-I/S-4	SKE-4
BTMCYL-I/S-10	SKE-10
BTMCYL-I/S-15	SKE-15
BTMCYL-I/S-20	SKE-20
BTMCYL-I/S-30	SKE-30
BTMCYL-I-40	SKE-40
BTMCYL-I-50	SKE-50
BTMCYL-I-70	SKE-70

15.0 SATELLITE SERIES SEAL LOCATION

15.1 Satellite Series Work Cylinder (Fig. 15.1.1)
15.2 Satellite Series Reservoir/Booster Unit (Fig. 15.2.1)

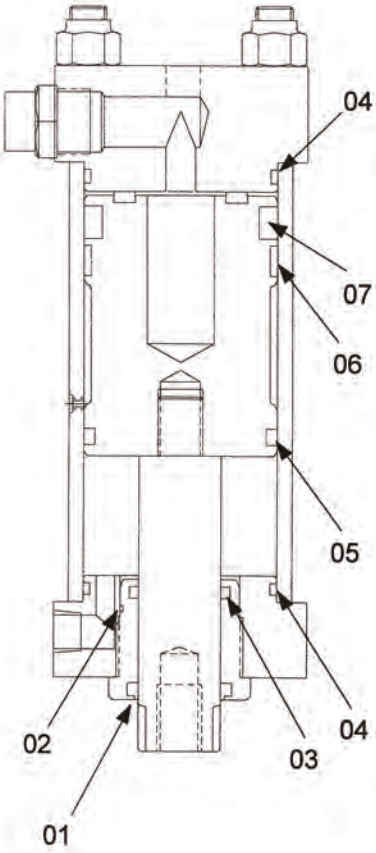


Fig. 15.1.1

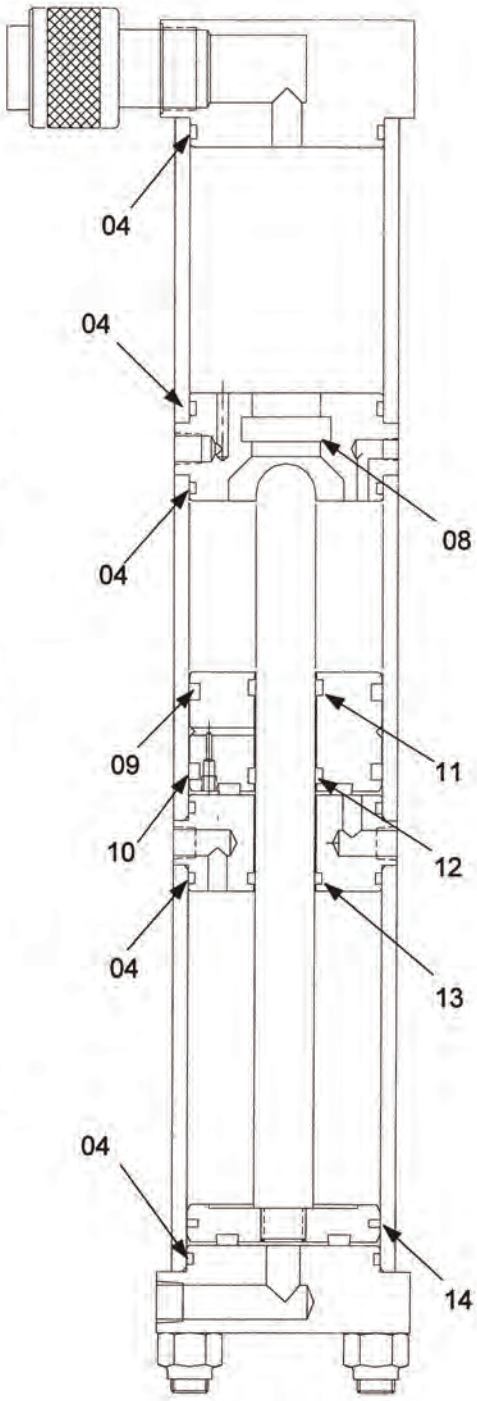


Fig. 15.2.1

No.	Qty.	Description
01	1	Rod Wiper
02	1	Bearing O-Ring
03	1	Bearing U-Cup
04	8	Tube O-Ring
05	1	Work Piston U-Cup (Pneu.)
06	1	Piston Bearing
07	1	Work Piston U-Cup (Hyd.)
08	1	Valve Block U-Cup
09	1	Reservoir Piston O.D. U-Cup
10	1	Reservoir Piston O.D. U-Cup
11	1	Reservoir Piston I.D. U-Cup
12	1	Reservoir Piston I.D. U-Cup
13	1	Seperator Block. O-Ring
14	1	Teflon Wear Ring
	1	High Pressure Piston O-Ring

16.0 IN-LINE SERIES SEAL LOCATION

17.1 In-Line Series Cylinder (Fig. 17.1.1)

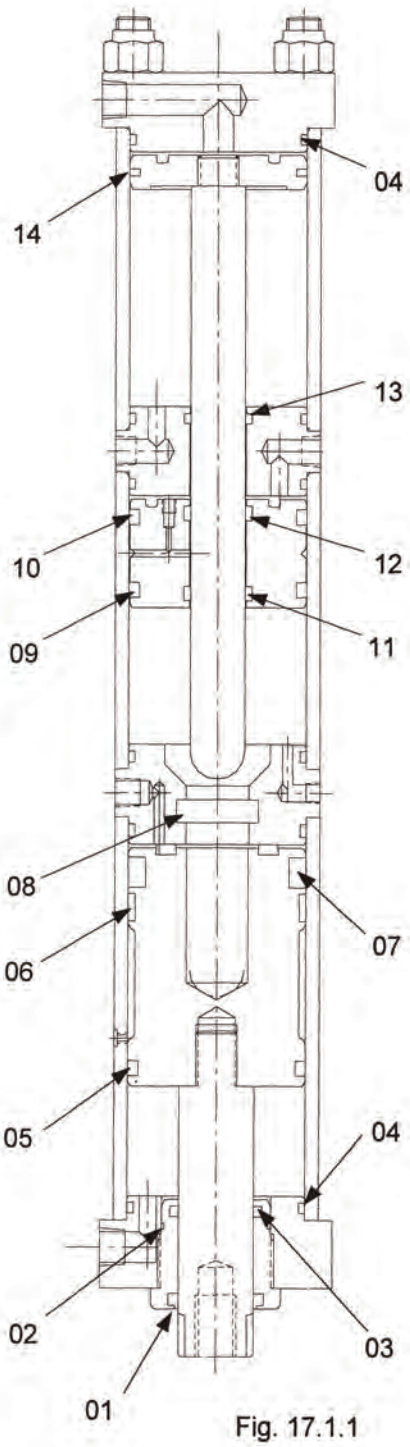


Fig. 17.1.1

No.	Qty.	Description
01	1	Rod Wiper
02	1	Bearing O-Ring
03	1	Bearing U-Cup
04	6	Tube O-Ring
05	1	Work Piston U-Cup (Pneu.)
06	1	Piston Bearing
07	1	Work Piston U-Cup (Hyd.)
08	1	Valve Block U-Cup
09	1	Reservoir Piston O.D. U-Cup
10	1	Reservoir Piston O.D. U-Cup
11	1	Reservoir Piston I.D. U-Cup
12	1	Reservoir Piston I.D. U-Cup
13	1	Seperator Block O-Ring
14	1	Teflon Wear Ring
	1	High Pressure Piston O-Ring

17.0 TECHNICAL SUPPORT

BTM application engineers are available during normal business hours to provide technical support.

You can reach an application engineer through one of the following contact methods:

Phone: 810-364-4567

Fax: 810-364-6178

Email: sales@btmcorp.com

Normal business hours are from 8:00am to 4:30pm, EST. Please have the cylinder model number and serial number when inquiring about a specific cylinder or replacement parts.

If you have an emergency outside of normal business hours, please call 810-364-4567 and follow the instructions.

Warranty Information:

BTM Corporation warrants its Air/Oil Cylinders to be free from defects in material or workmanship for a period of thirty-six (36) months from the date of shipment to the Distributor or Customer, provided any defect escaping our detection be reported in writing within thirty-six (36) months from the date of shipment to the Distributor or Customer. The warranty is limited to repairing or replacing, at BTM's option, F.O.B. BTM's factory, any part which upon inspection is found to be defective.

This warranty shall not apply:
a. to product which has been repaired or altered by parties other than BTM.
b. to product which has been subjected to negligence, accident, or damage by circumstances beyond the control of AEC, or, to improper installation, operation, maintenance, storage, or normal wear.

The above warranty comprises the company's sole and entire warranty obligation and liability in connection with BTM products. All other warranties, expressed or implied including without limitation, warranties or merchantability and fitness for a particular purpose, are expressly excluded. In addition. BTM shall not be held liable for consequential damages such as loss of profit, delays, expense, or breach of any contract, or injury resulting from inadequate guarding.

NOTES

NOTES

BTM® CORPORATION

BTM has a wide range of products to meet your needs including (but definitely not limited to):

PNEUMATIC CLAMPS & GRIPPERS

Light & Heavy Duty Clamps

Clamps range from light duty omni-directional head clamps to heavy duty precision sealed power clamps.

Light & Heavy Duty Grippers

BTM's Gripper line ranges from compact light duty models to locking & non-locking heavy duty models.

PIN PRODUCTS

Precision Shot Pin cylinders

BTM's Precision Part Locators are used whenever your production needs require locating precise holes in a workpiece.

Pin Locator Clamps

BTMs' Pin Locator Clamps and Single Finger clamps are used in stationary part nests, welding fixtures, transfer systems, robot end effectors and numerous other clamping applications. These clamps locate and hold the work while other operations are performed.

Standard pin sizes range from 12.5mm - 40mm.

SHEET METAL JOINING

Tog-L-Loc®

BTM's Tog-L-Loc® sheet metal joining system is a cold forming process that quickly joins pre-painted, galvanized, coated, and dissimilar metals.

Lance-N-Loc®

BTM's Lance-N-Loc® Joining System produces clean, strong and consistent joints in most coated or uncoated metals.

Ways to Tog-L-Loc®

Press Brakes

Handheld Units

Die Sets

Universal Presses

Hydraulic Units

Specialized Units

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www.BTMcorp.com